GRASSROOTS JOURNALS

Grassroots Journal of Natural Resources, Vol.7 No.3 (December 2024)
ISSN: 2581-6853 | CODEN: GJNRA9 | Published by The Grassroots Institute
Website: https://grassrootsjournals.org/gjnr | Main Indexing: Scopus and WoS

ISSN 2581-6853 | 7(3) Dec 2024

M – 00458 | Research Article

Exploring the Entrepreneurial Skills of Agriculture Students in Odisha, India

Rajeeb Kumar Behera*[1], Rabindra Kumar Raj[2]
[1]Department of Agricultural Extension and Communication, Faculty of Agricultural Sciences, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India.
Email: rkbehera28594@gmail.com | ORCID: https://orcid.org/0000-0002-2565-6036
[2]Department of Agricultural Extension and Communication, Faculty of Agricultural Sciences, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India.
Email: raj_rabindra@rediffmail.com | ORCID: https://orcid.org/0009-0006-0637-921X
**Corresponding author*

How to cite this paper: Behera, R.K. and Raj, R.K. (2024). Exploring the Entrepreneurial Skills of Agriculture Students in Odisha, India. *Grassroots Journal of Natural Resources*, 7(3): 180-202. Doi: https://doi.org/10.33002/nr2581.6853.070311

Received: 13 September 2024
Reviewed: 24 October 2024
Provisionally Accepted: 31 October 2024
Revised: 15 November 2024
Finally Accepted: 19 November 2024
Published: 31 December 2024
Copyright © 2024 by author(s)

Publisher's Note: We stay neutral with regard to jurisdictional claims in published maps, permissions taken by authors and institutional affiliations.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/

Open Access

Executive (Chief) Editor
Dr. Hasrat Arjjumend
Associate Editors
Dr. Usongo Patience
Ms. Areej Sabir
Assistant Managing Editor
Mr. Kartik Omanakuttan

Abstract

Entrepreneurial skills play a crucial role in making this world sustainable and self-sufficient for any country. It supports innovations so that new and innovative ideas can be generated in the minds of the people, mostly young minds. In this present study, the entrepreneurial skills of agriculture students are focussed and studied carefully so that agricultural improvement as well as national development can be achieved through shaping these skills using proper training and education at the institutional level. Planning, Enterprise Management, Credit & Finance, and Marketing skills are undertaken in the study to examine the entrepreneurial skills of the students. The data on entrepreneurial skills was collected from the respondents through the pre-tested questionnaire. Out of the total questionnaire responses received, 569 responses were found suitable for analysis for this study. The results obtained from the study state that the majority (61.16%) of the respondents had a medium level of entrepreneurial skills. Credit and Finance skills ranked highest followed by marketing skills. It was also noted that the respondents needed higher Enterprise management and planning skills. There was no significant influence of caste, locality and family size on entrepreneurial skills. However, attributes such as Economic Aptitude, Social Aptitude, Scientific Aptitude, Decision-Making Ability, Leadership Ability and Source of Information had highly statistically significant effects on entrepreneurial skills. In Odisha particularly, the focus should be given to the agriculture students' credit & finance and marketing skills. This research will be helpful for educational institutions in shaping education patterns and improving the entrepreneurial skills of students.

Keywords

Agriculture students, Entrepreneurial skills of Agriculture Students, Odisha, Odisha Students

Introduction

Entrepreneurship is a prime factor which can be used to improve the socio-economic status of the country. It contributes hugely to the growth of the national GDP (Acs, Desai and Hessels, 2008).

Odisha's growth is influenced by several factors including private sector participation in industrial activity and mining activities, along with improved primary education, health care, and agricultural productivity (Misra and Ghadai, 2017). Due to globalization and changes in technical aspects, the agriculture industry is also being changed severely. The adoption of new technologies is essential for exploring new opportunities in agriculture. Entrepreneurial orientation, which includes risk-taking and proactiveness, is crucial for technology adoption (Passarelli, Bongiorno and Cariola, 2021). To cope with this changing agriculture sector, entrepreneurial aspects need to be focussed. More than 65 per cent of the population in India is primarily dependent on cultivation (Samaddar, 2006). The essence of the agricultural sector identifies specific ways of improvement and highlights the role and importance of economic and social factors in its development (Riabokon, 2021). For the development of the agriculture sector, various institutions have been established (Putsenteilo *et al*., 2020). In Northern State Agricultural Universities (SAUs), approximately 87% of students enrolled in the B.Sc. Agriculture programs successfully graduate, while about 13% drop out before completing their degrees. A small percentage of students are admitted through the ICAR-AIEEA (UG) against reserved seats. After completing their undergraduate degrees, a substantial portion of agriculture graduates pursue further education, with 43% opting for master's programs and 28% for Ph.D. programs. Around 52% of agriculture graduates find employment in both public and private sectors, indicating a relatively strong job market for these graduates (Gupta, Mann and Sidhu, 2020). The Indian government has implemented various agriculture schemes, such as PM-KISAN, to provide direct income support to farmers and improve farm productivity (Tripathi *et al*., 2023). Yet, there has not been any substantial growth in this sector in the last decade. This highlights the need for further research to identify gaps and problems that need to be focussed and should be fulfilled. Among several aspects, the entrepreneurial skills of agriculture students need to be enhanced and their entrepreneurial training and skill development need to be critically analyzed. Coding and digital skills have a statistically significant positive impact on students' entrepreneurial engagement and student entrepreneurship (Sansone *et al.*, 2024). Self-awareness, problem-solving, and effective communication positively influence the development of entrepreneurial skills, which in turn significantly strengthen students' entrepreneurial confidence (Vera *et al.*, 2024). However, students' confidence in certain entrepreneurial skills declined significantly over time in live projects, suggesting the need for more structured and timely learning interventions (Chang and Rieple, 2013). Therefore, entrepreneurial skills that need critical development should be identified, and proper strategies should be followed to improve those skills.

In states such as Odisha, where most people depend on agriculture for their livelihood security, they need to develop entrepreneurship among them. Therefore, if agriculture students have entrepreneurial skills, then it will definitely improve this society as well as it will secure their future. This will also ensure agribusiness development and innovative solutions for the problems; ultimately, they can be part of the country's economic growth (Aliabadi *et al*., 2019).

Agriculture is a unique sector because it is dynamic and unpredictable in nature. It mostly depends on the weather conditions, severe fluctuation in the market and many other socio-economic factors. Therefore, entrepreneurial skills are very much required to be a good entrepreneur in this agriculture sector so that he or she will be a good analyser of

the present condition of the market and accordingly, he or she will be able to fulfil the demand of the customers. Therefore, this study focuses on four fundamental entrepreneurial skills: Planning, Enterprise Management, Credit & Finance, and Marketing. These skills are very much required to be a successful entrepreneur in the agriculture sector. Entrepreneurial success in the agriculture sector relies on key skills like planning, enterprise management, credit and finance, and marketing. Planning ensures structured decision-making by focusing on crop selection, resource allocation, and risk management, aiding in sustainable and profitable production while addressing challenges like climate change (Birley and Westhead, 2017; Morris *et al.,* 2017; Van Auken *et al*., 2006). Enterprise management emphasizes productivity, waste reduction, and adaptability to market changes through efficient use of land, labour, and capital (Aliabadi *et al.*, 2019; Beck *et al*., 2015; Birley and Westhead, 2017). Credit and finance skills help overcome capital barriers, enabling entrepreneurs to manage risks, cash flow, and investment opportunities effectively (Ataei *et al*., 2021; Beck *et al*., 2015). Lastly, marketing ensures customer needs are met profitably by leveraging market trends, branding, and pricing strategies to maximize returns and capitalize on opportunities (Aliabadi *et al*., 2019; Kotler and Armstrong, 2018; Kotler and Keller, 2016).

In Odisha, there is a diverse agro-climatic situation and agricultural base where farmers depend on traditional farming techniques. This gives vast scope for agriculture students to start various agroclimatic-based enterprises by developing entrepreneurial skills among them. A study conducted by Najafabadi, Zamani and Mirdamadi (2016) shows that entrepreneurial abilities account for 63% of the entrepreneurial aspirations among agricultural students. Young people in agriculture require entrepreneurial abilities for successful and expanding enterprises. These skills include personal attributes, social competencies, and the capacity for critical and innovative thinking (Bolarinwa and Okolocha, 2016). By knowing entrepreneurship skills, students will be able to promote mechanisation and advanced technologies in the farming sector (Chandrasekhar *et al*., 2006). For agricultural students in China, the practical application of entrepreneurship serves as a mediating factor between the entrepreneurship curriculum and students' satisfaction with their entrepreneurship education (Huang *et al*., 2022).

Therefore, this present study was undertaken to assess the skills of agriculture students in Odisha towards entrepreneurship across these four fundamental skills. It will evaluate the readiness of the agriculture students to be engaged in entrepreneurial activities and identify the gaps in their entrepreneurial skill development. The following hypotheses were tested in our study:

- H_1: The entrepreneurial skills of agriculture students in Odisha are at a low level on average.
- H_2: Socio-economic factors do not significantly influence the entrepreneurial skills of agriculture students in Odisha.
- H_3: Personal attributes do not significantly influence the entrepreneurial skills of agriculture students in Odisha.
- H_4: There is no significant difference in the entrepreneurial skills based on gender, caste & family major occupation.

Accordingly, the study is guided by the following objectives:

- To evaluate the levels of entrepreneurial skills among agriculture students in Odisha.
- To analyze the relationship between socio-economic factors and entrepreneurial skills.
- To know the relationship between the personal attributes and entrepreneurial skills of the respondents.
- To assess the differences in entrepreneurial skills based on gender, Caste and Family major occupation.

Methodology

This research adopted a quantitative approach using a cross-sectional survey to explore the entrepreneurial skills of final-year B.Sc. (Agriculture) students across nine agricultural colleges in Odisha, India, focusing on critical skills such as Planning, Enterprise Management, Credit and finance, and Marketing. To study these skills, a questionnaire was developed by doing a pilot study and with the help of a review of literature as well as experts in entrepreneurship. After that, this raw questionnaire was administered to 40 non-respondent agriculture students for pretesting. Reliability and validity test was done in SPSS after collecting the data in pre-testing to keep the most relevant statements for the study. The pretested questionnaire developed for the study was distributed in Google form to all the final-year agriculture students of Odisha in the academic year 2023-2024 to participate. The data were collected through Google form via the developed structured survey questionnaire, designed to measure students' perceptions of entrepreneurial skills using a three-point Likert scale (Most essential, Essential, Not essential).

The choice of a three-point Likert scale for this study was guided by the need for simplicity and clarity in response collection. A three-point scale—comprising "Most Essential," "Essential," and "Not Essential"—offers respondents a straightforward framework to express their perceptions of entrepreneurial skills. Unlike more granular scales, such as five-point or seven-point options, the three-point scale minimizes cognitive load and reduces the likelihood of confusion among respondents, particularly when the target population may vary in familiarity with Likert-type scales or possess differing levels of comprehension. Moreover, the three-point scale is particularly effective in ensuring that respondents focus on the essential aspects of the measured constructs, fostering precise and actionable data collection. While it is acknowledged that this format may limit the range of variability and the granularity of responses, it was deemed a suitable trade-off to maintain clarity and encourage higher response rates. This choice aligns with the objectives of the study to prioritize the identification of core perceptions without overcomplicating the data interpretation process. Socio-economic attributes were also captured to explore potential correlations. Data collection took place over two months, combining in-person visits and digital distribution via Google Forms and institutional WhatsApp groups. Google was prepared in such a way that one respondent can submit only once through his/her Gmail ID so that duplication of data will not occur. To collect correct responses from the respondents, their identity proof like registration no. and name etc. were not put in the Google form. 569 valid responses were retained after screening for completeness and consistency. Descriptive statistics, including mean, frequencies, and SD, were used to summarize the data. At the same

time, inferential analyses, such as correlation, were performed to identify relationships between entrepreneurial skills and independent (Socioeconomic and Individual attributes) variables. The independent variables taken under study were Caste, Locality, Family Type, Family Size, House Types, Education of the head of the family, Family Annual Income, Parents Land Holding, Economic Aptitude, Social Aptitude, Scientific Aptitude, Decision-Making Ability, Leadership Ability and Source of Information. Based on the Cut-off Score Method (AllPsych, n.d.), the level of entrepreneurial skills was categorised into Low (Scores less than Mean - SD), Medium (Scores between Mean – SD and Mean + SD) and High (Scores greater than Mean + SD). The Cut-off Score Method was used because it objectively categorizes entrepreneurial skills into Low, Moderate, and High levels based on statistical thresholds (Mean ± SD). This ensures standardized, unbiased classification and simplifies interpretation, especially in datasets with varying distributions. It is a widely accepted approach in behavioural and social science research. Test statistics like Mann Whitney U and Kruskal Wallis tests were also performed through the software IBM SPSS Statistics v21.

Statistical Tests Used in the Study

After the normal distribution test was done in SPSS, it was found that the data were not following normal distribution. So, the following non-parametric tests were taken for statistical analysis.

1. Mann-Whitney U Test: The Mann-Whitney U test, a non-parametric test, is used to compare differences between two independent groups when the data does not meet the assumptions of normality. This test is suitable for ordinal data or continuous data that do not follow a normal distribution, making it ideal for social science studies where responses often do not meet parametric assumptions.
Formula:
For two groups X and Y, each with n_1 and n_2 observations, respectively, the U statistic is calculated as:

$$U = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$

Where R_1 is the sum of the ranks for group X.

In this study, the Mann-Whitney U test was employed to assess differences between two demographic groups to determine if a statistically significant difference existed between their entrepreneurial skills variables.

2. Kruskal-Wallis Test: The Kruskal-Wallis test is an extension of the Mann-Whitney U test for comparing more than two independent groups. It assesses whether the medians of these groups differ significantly, making it suitable for ordinal data or non-normally distributed continuous data across multiple groups.
Formula:
The test statistic H is calculated as:

$$\mathrm{H} = \frac{12}{N(N+1)} \sum_{i=1}^{k} \frac{R_i^2}{n_i} - 3N(N+1)$$

Where:
N is the total number of observations,
k is the number of groups,
R_i is the sum of ranks for group i,
Ni is the number of observations in group i.

The Kruskal-Wallis test was applied to compare entrepreneurial skills across multiple demographic groups to know whether differences exist across these groupings in the context of entrepreneurial skills.

Results

Skills of the Agriculture Students towards Entrepreneurship

The analysis of factors influencing entrepreneurial skills highlighted that Credit & Finance were the strongest components, securing the top rank and emphasizing their critical role in equipping students with financial management and credit system competencies essential for entrepreneurial success. Marketing ranked second, underscoring the importance of promoting and selling agricultural products, though improvements in digital marketing and branding could further enhance this skill. Planning Skills, ranked third, reflected moderate proficiency in goal setting and resource organization, indicating the need for greater focus on strategic and long-term planning. Enterprise Management ranked fourth, revealed a gap in managing business operations, decision-making, and leadership, emphasizing the necessity for targeted interventions to strengthen these competencies. These findings suggest that while students excel in financial and marketing aspects, addressing deficiencies in planning and enterprise management is vital for developing comprehensive entrepreneurial skills in the agricultural sector.

Table 1 illustrates the ranking and level of Entrepreneurial Skills among the respondents.

For Planning Skills, the majority (46.4%) demonstrated medium proficiency, while a notable 31.81% exhibited high levels, reflecting the potential for strong organizational and goal-setting abilities. Similarly, in Enterprise Management, most respondents (49.21%) were in the medium category, with 29.0% achieving high levels, indicating moderate competence in managing business operations. Conversely, Credit & Finance and Marketing showed the highest concentration in the medium category, with 80.84% and 80.32% of respondents, respectively, but no respondents achieved high proficiency in these areas, highlighting significant gaps in financial and marketing expertise. Overall, the entrepreneurial skills distribution showed that while 61.16% of respondents possessed medium-level skills and 22.67% had high proficiency, a considerable 16.17% fell into the low category, underscoring the need for targeted interventions to improve financial and marketing skills while strengthening planning and enterprise management capabilities.

Correlation Analysis

The Spearman's Rank Correlation analysis (Table 2) highlighted significant relationships between various factors and entrepreneurial skill components, emphasizing the critical role of individual attributes. Leadership Ability, Social Aptitude, Scientific Aptitude,

and Decision-Making Ability showed strong positive correlations with planning, enterprise management, credit and finance, marketing, and overall entrepreneurial skills, all statistically significant at the 0.01 level, underscoring their importance in fostering entrepreneurial growth. Economic Aptitude and Source of Information also demonstrated moderate positive correlations, with significance at the 0.01 and 0.05 levels, reflecting the value of proactive decision-making and access to information in skill enhancement. In contrast, socioeconomic factors like Family Type and Parents' Land Holding showed significant negative correlations with planning and overall entrepreneurial skills at the 0.05 level, suggesting these traditional constraints might hinder entrepreneurial development. Other variables, such as Caste, Locality, and Family Annual Income, exhibited negligible correlations, indicating limited influence. These findings emphasize the need for targeted interventions to strengthen individual attributes while addressing socio-economic barriers to promote comprehensive entrepreneurial skill development among agriculture students.

Table 1: Rank & Level of Entrepreneurial Skills (n=569)

Factors of Entrepreneurial Skills	*Rank*	*Level*		
		Low	*Medium*	*High*
1. Planning Skills (Mean=2.62, SD=0.35)	III	124 (21.79%)	264 (46.4%)	181 (31.81%)
2. Enterprise management (Mean= 2.60, SD= 0.36)	IV	124 (21.79%)	280 (49.21%)	165 (29.0%)
3. Credit & Finance (Mean= 2.67, SD= 0.37)	I	109 (19.16%)	460 (80.84%)	0 (0.0%)
4. Marketing (Mean= 2.65, SD= 0.36)	II	112 (19.68%)	457 (80.32%)	0 (0.0%)
Overall Entrepreneurial Skills (Mean: 2.63, SD: 0.36)		92 (16.17%)	348 (61.16%)	129 (22.67%)

Note: Mean=Average Mean Score

Table 2: Spearman's Rank Correlations

Sl. No.	*Variable*	*Planning Skill*	*Enterprise Management Skill*	*Credit & Finance Skill*	*Marketing Skill*	*Overall Entrepreneurial Skill*
1	Caste	-0.032	-0.004	0.024	0.035	0.01
2	Locality	-0.064	-0.027	-0.025	-0.009	-0.039
3	Family Type	-0.093*	-0.07	-0.043	-0.059	-0.082*
4	Family Size	-0.033	-0.032	-0.031	-0.059	-0.046
5	House Types	-0.03	0.015	0.058	0.061	0.032
6	Education of the head of the family	0.021	-0.001	0.043	0.041	0.042
7	Family Annual Income	-0.07	-0.039	-0.077	0.01	-0.047
8	Parents Land Holding	-0.087*	-0.086*	-0.079	-0.071	-0.096*
9	Economic Aptitude	0.166**	0.156**	0.086*	0.122**	0.163**

Sl. No.	*Variable*	*Planning Skill*	*Enterprise Management Skill*	*Credit & Finance Skill*	*Marketing Skill*	*Overall Entrepreneurial Skill*
10	Social Aptitude	0.272**	0.221**	0.216**	0.264**	0.283**
11	Scientific Aptitude	0.246**	0.225**	0.197**	0.184**	0.246**
12	Decision-Making Ability	0.261**	0.226**	0.262**	0.188**	0.273**
13	Leadership Ability	0.325**	0.279**	0.240**	0.228**	0.308**
14	Source of Information	0.207**	0.140**	0.086*	0.138**	0.166**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Gender and Entrepreneurial Skills

The Mann-Whitney U Test assessed the differences in entrepreneurial skills between male and female agriculture students in Odisha across four key areas: Planning, Enterprise Management, Credit and finance, and Marketing. The results revealed no significant differences in any of these dimensions, with p-values of 0.454 for Planning (U = 38231.500, Z = -0.749), 0.333 for Enterprise Management (U = 37812.000, Z = -0.967), 0.582 for Credit & Finance (U = 38637.500, Z = -0.551), and 0.236 for Marketing (U = 37424.000, Z = -1.186). Furthermore, the overall entrepreneurial skillset, which combined these four dimensions, also showed no significant difference between genders, with a p-value of 0.237 (U = 37363.000, Z = -1.183). These results indicate that the distribution of entrepreneurial skills is comparable between male and female students, suggesting that gender does not significantly influence entrepreneurial competencies within the sample. The test statistics confirm that gender equality in entrepreneurial skills is present among agriculture students in this context (Table 3).

The figure visually represents the outcomes of the Mann-Whitney U Test, comparing the entrepreneurial skills of male and female agriculture students across various dimensions. The figure's primary objective is to examine notable distinctions between males and females regarding various entrepreneurial aspects. These include Planning, Enterprise Management, Credit & Finance, Marketing, and overall Entrepreneurial Skills. Each skill category is compared based on gender, and the results show that the distribution of skills is similar across both groups, indicating no significant difference in entrepreneurial abilities between male and female students. The figure emphasizes the statistical findings of gender equality in entrepreneurial competencies among agriculture students (Figure 1).

Caste and Entrepreneurial Skills

The Kruskal-Wallis test assessed the distribution of entrepreneurial skills across different caste categories among agriculture students in Odisha, focusing on Planning, Enterprise Management, Credit and Finance, Marketing, and overall Entrepreneurial Skills. The results showed no significant differences in any of the skill dimensions across caste categories. For Planning Skill, the p-value was 0.199 with a chi-square value of

3.232 (df = 2); for Enterprise Management Skill, the p-value was 0.275 with a chi-square value of 2.583 (df = 2); for Credit & Finance Skill, the p-value was .478 with a chi-square value of 1.476 (df = 2); for Marketing Skill, the p-value was 0.345 with a chi-square value of 2.130 (df = 2); and for overall Entrepreneurial Skill, the p-value was 0.220 with a chi-square value of 3.024 (df = 2). In all cases, caste does not significantly influence the students' distribution of these entrepreneurial skills (Table 4).

Table 3: Mann-Whitney U Test based on gender

	Planning Skill	*Enterprise Management Skill*	*Credit & Finance Skill*	*Marketing Skill*	*Entrepreneurial Skill*
Mann-Whitney U	38231.500	37812.000	38637.500	37424.000	37363.000
Wilcoxon W	91206.500	90787.000	91612.500	90399.000	90338.000
Z	-0.749	-0.967	-0.551	-1.186	-1.183
Asymptotic Significance (2-tailed)	0.454	0.333	0.582	0.236	0.237

Based on the Kruskal-Wallis test findings and supporting box plot data, no statistically meaningful variations were observed in the distribution of Entrepreneurial Skill components (Planning, Enterprise Management, Credit & Finance, and Marketing) or overall Entrepreneurial Skill among different caste groups. The box plots show consistent median values, similar interquartile ranges, and an absence of significant outliers across all skills, suggesting that the distribution of these skills is uniform among the different caste categories. The p-values for all skills are above the 0.05 threshold, confirming that caste does not significantly influence the entrepreneurial skills assessed in this study (Figure 2).

Table 4: Kruskal Wallis Test based on Caste

	Planning Skill	*Enterprise Management Skill*	*Credit & Finance Skill*	*Marketing Skill*	*Entrepreneurial Skill*
Chi-Square	3.232	2.583	1.476	2.130	3.024
df	2	2	2	2	2
Asymptotic Significance	0.199	0.275	0.478	0.345	0.220

Family Major Occupation and Entrepreneurial Skills

The test Kruskal-Wallis was conducted to know the differences in skills in entrepreneurship of the agriculture students in Odisha based on their family's major occupation. The test examined Planning Skill (Chi-square = 6.780, p = 0.238), Enterprise Management Skill (Chi-square = 3.116, p = 0.682), Credit & Finance Skill (Chi-square = 7.489, p = 0.187), Marketing Skill (Chi-square = 6.047, p = 0.302), and overall Entrepreneurial Skill (Chi-square = 6.063, p = 0.300). The analysis revealed no statistically significant variations in entrepreneurial abilities among different family occupation groups, as all p-values exceeded the 0.05 significance threshold (Table 5).

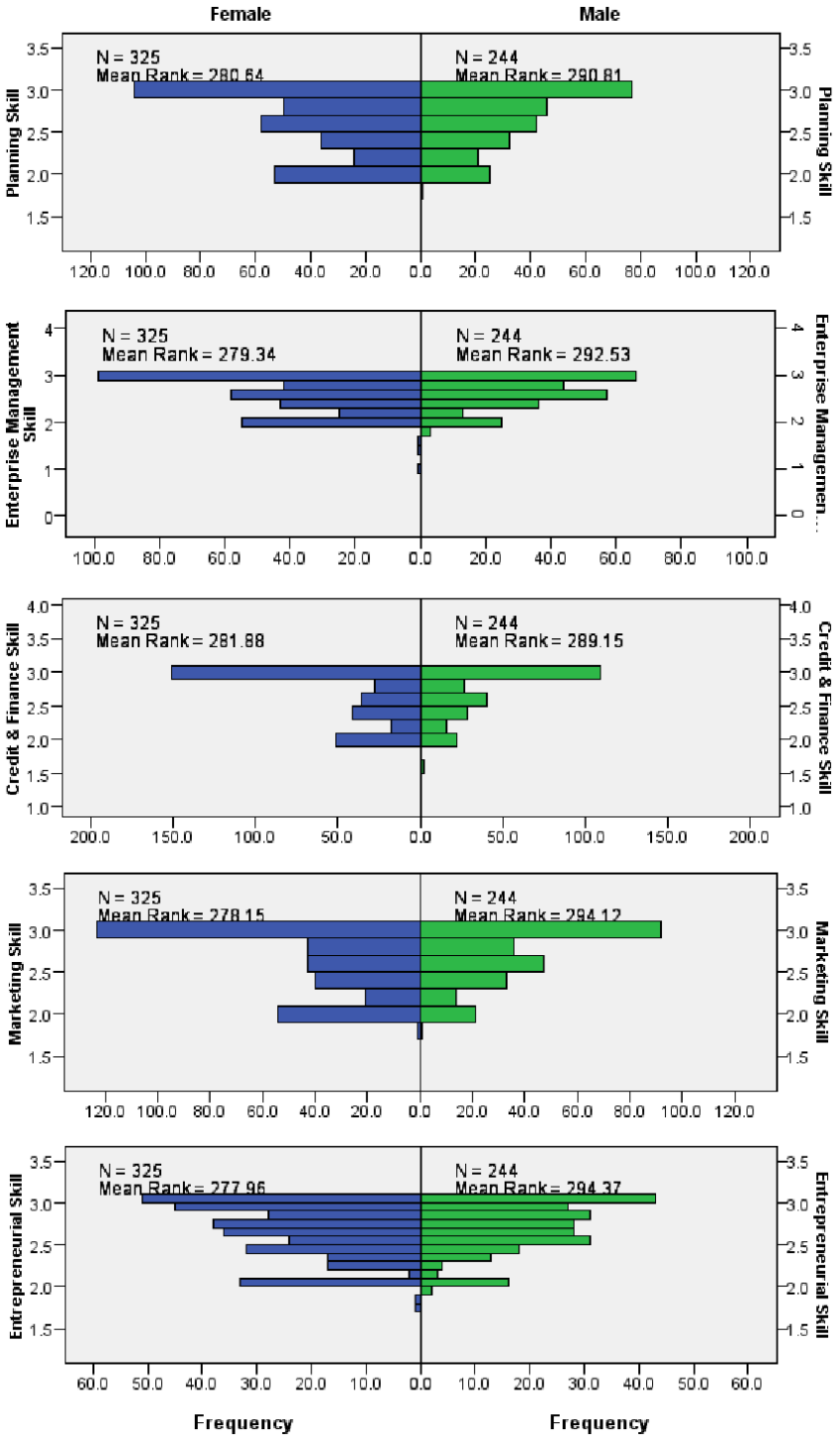

Figure 1: Mann-Whitney U Test based on Gender

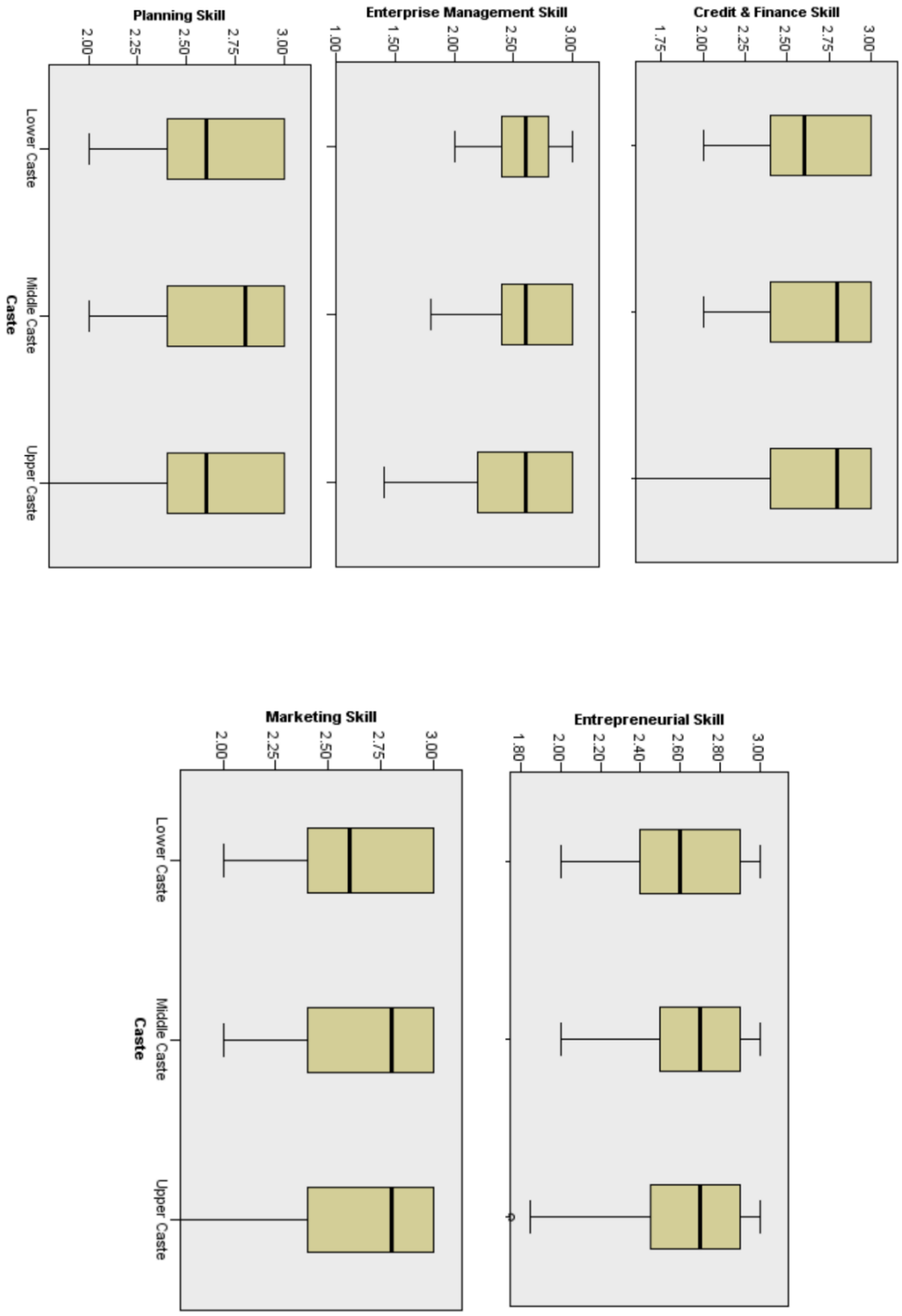

Figure 2: Kruskal Wallis Test based on Caste

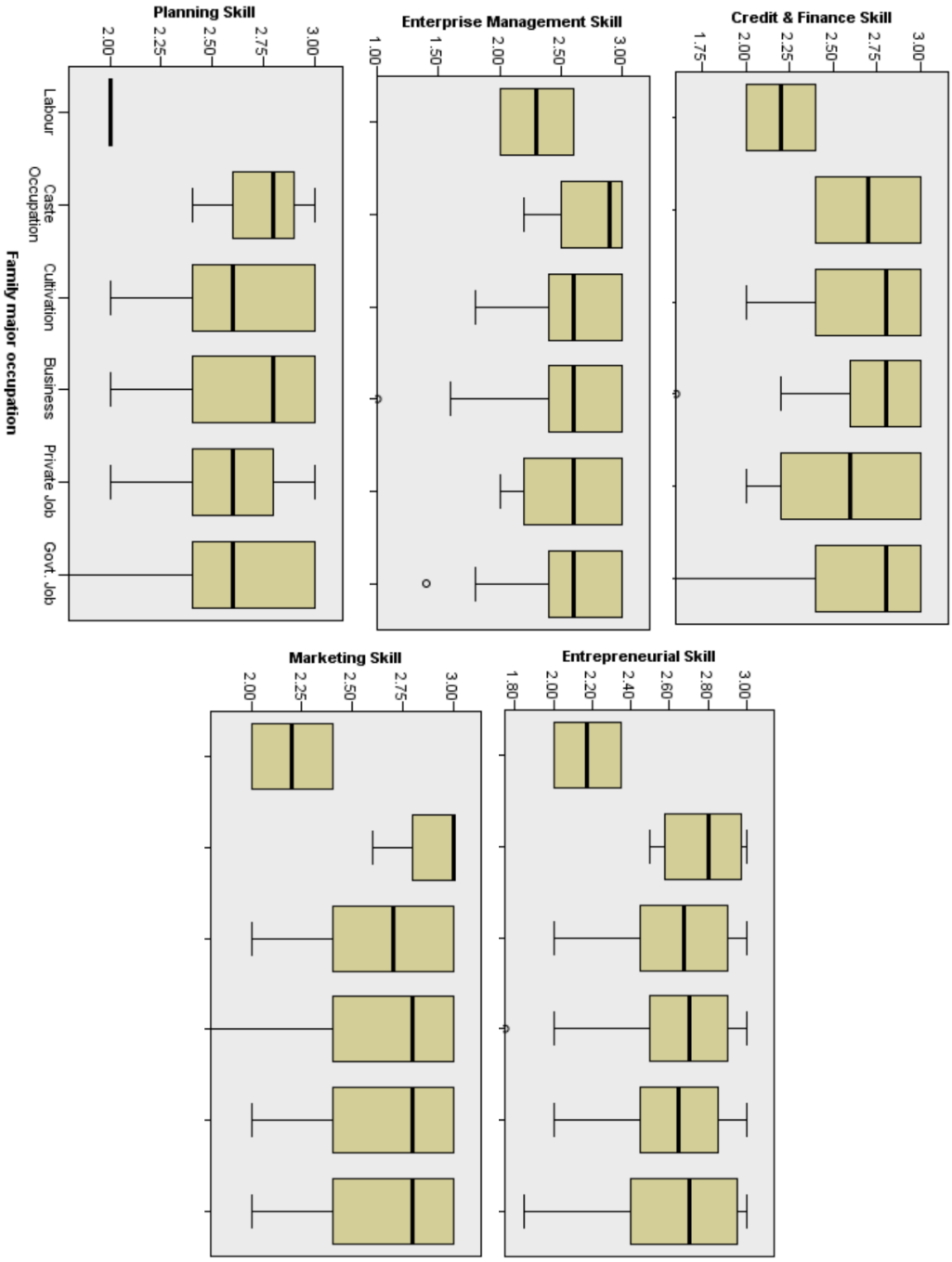

Figure 3: Kruskal Wallis Test based on Family Major Occupation

The box plots corresponding to the Kruskal-Wallis test for entrepreneurial skills, based on family major occupation, visually represent the distribution of scores across various family backgrounds. For Planning Skills, the spread of scores is relatively consistent across categories, with some minor variations, indicating no significant difference ($p = 0.238$). The Enterprise Management Skill box plot shows similar distributions across all

categories, which aligns with the non-significant p-value of 0.682. The Credit & Finance Skill plot displays slight variations, particularly in the interquartile range, but these differences are not statistically significant (p = 0.187). For Marketing Skills, the box plot reveals a broad distribution, yet there is no statistically significant difference across the family occupation categories (p = 0.302). Finally, the overall Entrepreneurial Skill box plot also shows no notable differences, with a p-value of 0.300, confirming no significant variation between groups (Figure 3).

Table 5: Kruskal Wallis Test based on Family Major Occupation

	Planning Skill	*Enterprise Management Skill*	*Credit & Finance Skill*	*Marketing Skill*	*Entrepreneurial Skill*
Chi-Square	6.780	3.116	7.489	6.047	6.063
df	5	5	5	5	5
Asymptotic Significance	0.238	0.682	0.187	0.302	0.300

Discussion

The findings of this research provide valuable insights into the entrepreneurial skill set of agriculture students in Odisha, highlighting both strengths and areas for improvement. Credit & Finance emerged as the strongest component, ranking first in the analysis. This reflects the critical importance of financial management skills for agricultural entrepreneurs, as effective handling of finances, credit systems, and funding opportunities is crucial for the sustainability and growth of any business. The fact that many students demonstrated proficiency in this area is encouraging, but the absence of students with high proficiency indicates room for further development. Strengthening financial literacy and practical exposure to credit management through targeted interventions in the curriculum or extracurricular programs could better equip students to handle the complexities of financial decision-making in entrepreneurial ventures.

Marketing skills, ranked second, were also a key strength among students. This skill is crucial in the context of agriculture, where promoting and selling products is essential to the success of farming ventures. While the medium proficiency levels are promising, the lack of high proficiency in marketing is a concern. This gap presents an opportunity for students to further develop their marketing acumen, particularly in areas like digital marketing, branding, and market research. Given the growing importance of online platforms and social media in modern agriculture, integrating digital marketing strategies into agricultural education could help students gain a competitive edge in the marketplace.

Planning skills ranked third, with 31.81% of respondents demonstrating high proficiency. This finding suggests that many students have a strong foundation in setting goals and organizing resources, which is critical for entrepreneurial success in agriculture. However, the fact that 46.4% of students demonstrated medium proficiency indicates that planning skills may not be sufficiently developed across the board. To address this, agricultural education programs could focus more on strategic and long-term planning, emphasizing scenario analysis, business forecasting, and risk management. Practical exercises that challenge students to develop comprehensive

business plans could foster better decision-making and resource allocation in real-world entrepreneurial settings. Enterprise management ranked fourth, revealing significant gaps in business operations management, leadership, and decision-making. With only 29.0% of students achieving high proficiency in this area, it is clear that this is a key area for intervention. Strong leadership and decision-making abilities are essential for managing the complexities of agricultural enterprises. The findings suggest that students may benefit from more hands-on experience in running small-scale agricultural businesses or simulation exercises that focus on operations, leadership, and crisis management. Integrating leadership development into the curriculum and offering mentorship opportunities from successful agricultural entrepreneurs could also help bridge this gap. The overall distribution of entrepreneurial skills shows that while a majority of students (61.16%) possess medium-level skills, a notable 16.17% fall into the low proficiency category. This highlights the need for targeted interventions to elevate students' competencies in key areas, particularly Credit & Finance, Marketing, and Enterprise Management. By addressing these deficiencies, agricultural education can better prepare students for the challenges of starting and sustaining entrepreneurial ventures in the agricultural sector. While the results indicate that students in Odisha exhibit strong financial and marketing skills, significant gaps in planning and enterprise management need to be addressed. Focusing on these areas will ensure that agriculture students are equipped with a comprehensive set of entrepreneurial skills, enhancing their readiness to launch successful businesses in the agricultural sector. Tailored interventions and an enhanced curriculum focusing on strategic planning, digital marketing, and enterprise management will be essential in fostering a more robust entrepreneurial ecosystem in Odisha.

Interestingly, 22.67% of the students exhibit high-level entrepreneurial skills, demonstrating that a substantial portion of students are well-prepared for entrepreneurial ventures. These students likely have a solid grasp of the necessary competencies, such as decision-making, resource management, and strategic thinking, which are crucial for the success of agricultural businesses. Their readiness suggests that current entrepreneurship education programs are effective for some but not all. However, the presence of 16.17% of students in the low-skill category reveals a gap in preparedness. This group represents a significant portion of the student population that is not adequately equipped for entrepreneurship, potentially due to a lack of targeted education or practical exposure to entrepreneurial activities. The fact that these students are not reaching the necessary competency levels signals a need for a more comprehensive and inclusive approach to entrepreneurship education. By enhancing training in these areas, along with fostering skills like problem-solving, leadership, and innovation, a more robust entrepreneurial education framework can be developed. This will not only raise the competency of students in the medium and low categories but also ensure that all students are adequately prepared to thrive in the agricultural industry.

While the analysis shows a solid foundation in entrepreneurial skills among the majority of students, the need for a holistic and integrated educational approach is clear. Strengthening education in planning & enterprise management skills will be critical in ensuring that all students, regardless of their starting point, are equipped with the skills necessary to succeed in the rapidly evolving agricultural sector. Incorporating hands-on practical training in agricultural education programs increases students' understanding of

real-world phenomena and grants them new skill sets (Wells, 2014). Incorporating hands-on practical training in agricultural education programs through international volunteer assignments can help graduate students gain practical experience, improve interpersonal skills, and enhance cultural competencies (Zickafoose and Wingenbach, 2023).

The correlation analysis sheds light on the multifaceted influences on entrepreneurial skills among agriculture students in Odisha. The findings indicate that socio-economic factors such as caste, locality, family size, house types, and the education level of the head of the family do not significantly impact the development of entrepreneurial skills. However, family structure, as represented by family type, seems to exert some influence, as negative correlations suggest that students from nuclear or smaller families may face challenges in developing entrepreneurial planning and overall skills. This finding calls for a deeper understanding of how family dynamics shape entrepreneurial ambitions and skill acquisition. Interestingly, parents' landholding is inversely related to entrepreneurial skill development. Students from families with more extensive landholdings appear to have less necessity to develop these skills, likely due to the economic stability provided by the land. This may reduce their motivation to engage in entrepreneurial activities. In contrast, students with higher *economic aptitude* tend to develop more vital entrepreneurial skills, indicating that understanding economic principles is critical in navigating entrepreneurial ventures. Moreover, *social and scientific aptitudes* stand out as pivotal factors. The significant positive correlations between these aptitudes and entrepreneurial skills underscore the importance of networking, communication, and scientific reasoning in fostering entrepreneurial competencies. Students who demonstrate strong social skills are likely to excel in areas like marketing, where interaction and relationship-building are essential. At the same time, those with scientific aptitude are better equipped to innovate and adapt to the technical demands of modern agricultural entrepreneurship.

To foster decision-making ability, leadership skills, and information-seeking behaviour through curriculum design and extracurricular programs, agricultural education must be strategically structured to address these key competencies. These traits are critical for entrepreneurial success, and educational frameworks can be enhanced to better develop these skills among students. Curriculum design should incorporate decision-making frameworks and problem-solving methodologies that allow students to engage with real-world agricultural business challenges. Agricultural students could benefit from simulation-based learning and case studies that replicate situations like crop management decisions, resource allocation, or managing supply chain disruptions. By applying theoretical knowledge to practical scenarios, students learn to make sound decisions under uncertainty, which is a fundamental aspect of entrepreneurship. Additionally, project-based learning can be incorporated into the curriculum, where students work on real-world agricultural projects requiring decisions that directly impact the outcome. These projects could involve designing sustainable farming systems or managing the business side of an agricultural operation. By leading these projects, students can gain first-hand experience in making high-stakes decisions and refining their decision-making processes. Furthermore, incorporating workshops focused on risk management, crisis management, and business strategy will help students enhance their ability to think critically and make informed decisions.

Leadership skills are indispensable for agricultural entrepreneurs, and these can be developed through both curricular and extracurricular activities. Within the curriculum, students can take on leadership roles in group projects related to agricultural business management, such as marketing, production planning, or financial management. These projects should simulate real-world agricultural business challenges, allowing students to apply leadership skills in a controlled but realistic environment. Courses that emphasize team management, strategic planning, and operational leadership will further strengthen their ability to guide teams toward successful outcomes. Extracurricular programs also play a vital role in cultivating leadership skills. Agricultural education programs should offer students the opportunity to take part in student-run agricultural cooperatives or entrepreneurial clubs, where they can practice leading teams and managing agricultural projects. Collaboration with local agribusinesses for internships or apprenticeships would also provide students with hands-on experience in leadership roles. By taking part in leadership training workshops and working on community-based agricultural projects, students will gain the practical skills needed to lead agricultural ventures in the future. Source of Information is another critical component of entrepreneurial success, as it allows students to stay informed and adaptable in a constantly changing agricultural industry. The curriculum should focus on developing students' research and technological skills by teaching them how to access and analyze agricultural data, market trends, and industry innovations. Students can be encouraged to explore agricultural research databases, use data analytics tools in farm management, and keep up with emerging topics such as sustainable farming practices and new technologies in agriculture. In addition to formal coursework, students should be encouraged to engage in research projects that explore current challenges in agriculture. These projects can involve topics like the adoption of new technologies, climate resilience, or market access strategies for smallholder farmers. Mentorship programs, where experienced professionals guide students in researching and applying new knowledge, would also be beneficial. Encouraging students to participate in agricultural conferences, seminars, and workshops will expose them to the latest industry developments and further develop their ability to seek out and apply relevant information.

Extracurricular programs are key to providing students with opportunities to apply decision-making, leadership, and information-seeking skills in a dynamic, real-world context. Leadership camps, decision-making challenges, and entrepreneurial competitions can simulate real-life agricultural business scenarios, allowing students to practice these skills in a competitive yet supportive environment. These activities can be organized in collaboration with local businesses, agricultural cooperatives, and industry leaders, further enriching the students' experience. Furthermore, agricultural education programs could partner with agricultural organizations and research institutions to organize workshops, hackathons, or industry forums focused on solving current agricultural problems. Through these events, students can tackle complex issues in agriculture, where they will need to make decisions, lead teams, and actively seek out innovative solutions. This hands-on approach to learning will deepen their understanding of entrepreneurship and prepare them to take on leadership roles in the agricultural sector. By strategically integrating decision-making, leadership skills, and sources of information into both the curriculum and extracurricular activities, agricultural education can better prepare students for entrepreneurial success. Encouraging hands-on learning through decision-making simulations, leadership opportunities through team-based projects, and fostering a culture of continuous learning will equip students with the essential skills to navigate the

challenges of agricultural entrepreneurship. These recommendations ensure that students not only gain technical knowledge but also develop the practical skills necessary to succeed as future leaders in the agricultural industry.

So, the results suggest that while some socio-economic factors such as family income or size may not significantly affect entrepreneurial skills, attributes like economic, social, and scientific aptitude, leadership, decision-making ability, and source of information are crucial. These findings highlight the need for targeted skill development programs focusing on enhancing these attributes, especially for students from wealthier or more agriculturally stable families who may lack the need to develop entrepreneurial competencies organically.

The results of the Mann-Whitney U Test reveal that gender does not play a significant role in the entrepreneurial skills of agriculture students in Odisha. Across all vital entrepreneurial dimensions—planning, enterprise management, credit & finance, and marketing—both male and female students exhibit comparable skill levels. This outcome supports the notion that agricultural entrepreneurship, at least in the studied cohort, is not influenced by gender differences. The findings align with contemporary trends in entrepreneurship, where opportunities and competencies are increasingly accessible regardless of gender. It also indicates the agricultural education system in Odisha, which seems to provide an equitable environment for skill development among all students, irrespective of gender. However, it is essential to consider that while these results demonstrate equality in skills, future research could explore factors beyond gender, such as socio-economic background or access to resources, to understand disparities in entrepreneurial success further. Additionally, qualitative studies could provide deeper insights into the experiential aspects of entrepreneurship for male and female students in agriculture.

The results of the Kruskal-Wallis test suggest that caste does not significantly influence the entrepreneurial skills of agriculture students in Odisha. The skill levels are similar among students from different caste categories across the critical dimensions of Planning, Enterprise Management, Credit and Finance, Marketing, and overall Entrepreneurial Skills. This finding indicates that caste is not a determining factor in the entrepreneurial competency of students, reflecting a potential levelling of skill development opportunities regardless of caste background. These results align with recent trends in education and entrepreneurship, where access to resources, skill-building opportunities, and educational interventions are becoming more inclusive. The findings highlight the equitable distribution of entrepreneurial skills among students from various social backgrounds, underscoring the efforts made to bridge traditional social divides in skill development. However, while caste does not appear to affect entrepreneurial skills, future studies could explore other socio-economic factors that might influence entrepreneurial outcomes, such as family income or educational access. This analysis provides valuable insights for policymakers aiming to foster an inclusive entrepreneurial ecosystem, ensuring that students from all caste backgrounds are equally prepared for entrepreneurial ventures. The box plots also suggest that the entrepreneurial skills measured in this sample are uniformly distributed across caste categories, highlighting that other factors, rather than caste, may be more influential in determining these skills. This aligns with the findings from the Kruskal-Wallis test, where no p-value reached

statistical significance, further reinforcing that caste is not a differentiating factor in this analysis. In summary, the box plot images corroborate the non-significant results of the Kruskal-Wallis test, suggesting homogeneity in entrepreneurial skills across caste groups in this sample. Future studies may explore other socio-economic or educational factors to understand better what influences entrepreneurial skills in this context.

The findings of the Mann-Whitney U and Kruskal-Wallis tests reveal that gender, caste, and family major occupation do not significantly impact the entrepreneurial skills of agriculture students in Odisha. These results suggest that opportunities for skill development in critical areas such as Planning, Enterprise Management, Credit & Finance, and Marketing are accessible to students regardless of their caste or family background. This aligns with the increasing inclusivity in education and entrepreneurship, where access to resources, educational interventions, and skill-building opportunities are becoming more widespread. The equitable distribution of entrepreneurial skills across various social backgrounds reflects the positive impact of inclusive educational policies and the efforts made to level the playing field for all students, regardless of caste or family background.

While caste and family occupation appear not to affect entrepreneurial skills, it is essential to consider other socio-economic factors that might influence entrepreneurial outcomes. For instance, family income and access to educational resources may create disparities in students' ability to capitalize on entrepreneurial opportunities. These factors could shape the skills students develop, particularly those related to accessing networks, capital, or mentorship. Future studies could explore how these socioeconomic elements affect entrepreneurial capabilities, particularly in marginalized groups who might face barriers to resource access. Understanding these barriers could help identify areas for targeted interventions to ensure that all students have equal opportunities to succeed in agricultural entrepreneurship.

This study will be helpful for the institutions to shape the syllabus of agriculture taught and the students will get proper need-based skill training programs. By which the students will be able to contribute not only to their family but also to society as well as the country in terms of finance. Search types of initiatives are important for rural growth and development in Odisha and beyond (Bosman, 2019).

Conclusion

The study on entrepreneurial skills of agriculture students in Odisha offers a deep insight into the current state of entrepreneurship education and competencies among students in the region. While students demonstrate moderate proficiency in entrepreneurial abilities, key areas like Credit and Finance and Marketing Skills show notable deficiencies, with none of the students reaching a high proficiency level. This finding points to an urgent need for specialized training in these fields, which are crucial for entrepreneurial success in agriculture. On the other hand, skills related to Planning and Enterprise Management are comparatively stronger, but a significant portion of students remain in the lower-skill category. This suggests that while students may have a foundational understanding, their ability to practically apply these skills is limited and requires further development. Interestingly, socio-economic factors such as caste, locality, and family size do not

appear to significantly impact the development of entrepreneurial skills. This challenges some common assumptions and highlights the importance of individual attributes like decision-making, leadership, and a proactive attitude toward seeking information. These personal qualities play a more decisive role in shaping entrepreneurial competencies, suggesting that entrepreneurship education must also focus on enhancing these traits. The lack of a gender divide in entrepreneurial skills is another critical finding, demonstrating that both male and female students have equal opportunities within the entrepreneurial education system. However, the study suggests that the existing education framework needs to be expanded with targeted interventions, particularly in financial literacy and marketing, to ensure students are well-prepared for the entrepreneurial demands in the agricultural sector. Moreover, programs that aim to boost leadership, decision-making, and problem-solving abilities are essential. These skills not only complement technical expertise but also empower students to adapt to challenges, make informed decisions, and lead their ventures successfully. In summary, the study underlines the importance of a more tailored and holistic approach to entrepreneurial education, one that strengthens both technical skills and personal attributes necessary for entrepreneurial success in agriculture.

References

Acs, Z.J., Desai, S. and Hessels, J. (2008). Entrepreneurship, economic development and institutions. *Small Business Economics*, 31(3): 219–234. DOI: https://doi.org/10.1007/s11187-008-9135-9.

Aliabadi, V., Ataei, P., Gholamrezai, S. and Aazami, A. (2019). Components of sustainability of entrepreneurial ecosystems in knowledge-intensive enterprises: The application of fuzzy analytic hierarchy process. *Small Enterprise Research*, 26(3): 288-306. DOI: https://doi.org/10.1080/13215906.2019.1671215.

AllPsych. (n.d.). *Cut-off score: Mean and standard deviation*. Available online at: https://allpsych.com/stats/unit2/53-2/ [Accessed on December 16, 2024[.

Ataei, P., Ghadermarzi, H., Karimi, H. and Norouzi, A. (2021). The process of adopting entrepreneurial behaviour: Evidence from agriculture students in Iran. *Innovations in Education and Teaching International*, 58(3): 340-350. DOI: https://doi.org/10.1080/14703297.2020.1734476.

Beck, T., Demirguc-Kunt, A. and Levine, R. (2015). SMEs, growth, and poverty: Cross-country evidence. *Journal of Economic Growth*, 10(3): 199-229. DOI: https://doi.org/10.1007/s10887-005-3533-5.

Birley, S. and Westhead, P. (2017). A comparison of new business start-ups by "novice" and "habitual" founders. *Journal of Business Venturing*, 8(3): 101-122. DOI: https://doi.org/10.1016/0883-9026(93)90012-J.

Bolarinwa, K. and Okolocha, C. (2016). Entrepreneurial Skills Needed by Farm Youths for Enhanced Agricultural Productivity. *Journal of Economics and Sustainable Development*, 7: 65-71.

Bosman, L. (2019). From doing to thinking: Developing the entrepreneurial mindset through scaffold assignments and self-regulated learning reflection. *Open Education Studies*, 1(1): 106–121. DOI: https://doi.org/10.1515/edu-2019-0007.

Chandrasekhar, C.P., Ghosh, J. and Roychowdhury, A. (2006). The demographic dividend and young India's economic future. *Economic and Political Weekly*, 41(49): 5055-5064.

Chang, J. and Rieple, A. (2013). Assessing students' entrepreneurial skills development in live projects. *Journal of Small Business and Enterprise Development*, 20: 225-241. DOI: https://doi.org/10.1108/14626001311298501.

Gupta, R., Mann, S. and Sidhu, K. (2020). Educational progression and employment status of agriculture graduates of northern SAUs. *International Journal of Home Science*, 6: 13-17.

Huang, Y., Bu, Y., Liu, L., Xu, D., Xu, Z. and Zhao, G. (2022). Relationship between Entrepreneurship Education Curriculum and Agricultural Students' Satisfaction in China. *Frontiers in Psychology*, 13. DOI: https://doi.org/10.3389/fpsyg.2022.884565.

Kotler, P. and Armstrong, G. (2018). *Principles of Marketing* (17th ed.). Pearson Education.

Kotler, P. and Keller, K.L. (2016). *Marketing Management* (15th ed.). Pearson Education.

Misra, S.N. and Ghadai, S.K. (2017). Growth, equity and poverty: Trends in Odisha. *Parikalpana: KIIT Journal of Management*, 13(1): 56-65.

Morris, M.H., Webb, J.W., Fu, J. and Singhal, S. (2017). A competency-based perspective on entrepreneurship education: Conceptual and empirical insights. *Journal of Small Business Management*, 54(1): 118-135. DOI: https://doi.org/10.1111/jsbm.12150.

Najafabadi, M., Zamani, M. and Mirdamadi, M. (2016). Designing a model for entrepreneurial intentions of agricultural students. *Journal of Education for Business*, 91: 338 - 346. https://doi.org/10.1080/08832323.2016.1218318.

Passarelli, M., Bongiorno, G. and Cariola, A. (2021). Technology adoption in agriculture: a new entrepreneurial approach is possible? *Agribusiness and Information Management*, 13(1): 1-25.

Putsenteilo, P., Klapkiv, Y., Karpenko, V. and Gvozdecka, I. (2020). The role of institutions in the development of agriculture. *Bulgarian Journal of Agricultural Science*, 26: 23-33.

Riabokon, V. (2021). Socio-economic conditions of agricultural sector development. *Ekonomika APK*. DOI: https://doi.org/10.32317/2221-1055.202102006.

Samaddar, A. (2006). Traditional and Post traditional: A Study of Agricultural Rituals in Relation to Technological Complexity among Rice Producers in Two Zones of West Bengal, India. *Culture & Agriculture*, 28(2): 108-121. https://doi.org/10.1525/cag.2006.28.2.108.

Sansone, G., Ghezzi, A., Landoni, P. and Rangone, A. (2024). Students' Entrepreneurial Engagement and Student Entrepreneurship: Do Coding and Digital Skills Matter?. *IEEE Transactions on Engineering Management*, 71: 5733-5743. DOI: https://doi.org/10.1109/TEM.2024.3367893.

Tripathi, G., Dhodia, A., Giri, A., Rathore, V., Verma, A., Shukla, A. and Verma, L. (2023). Government Agriculture Schemes in India: A Review. *Asian Journal of Agricultural Extension, Economics & Sociology*, 41(11): 58-67. DOI: https://doi.org/10.9734/ajaees/2023/v41i112261.

Van Auken, H., Fry, F.L. and Stephens, P. (2006). The influence of role models on entrepreneurial intentions. *Journal of Developmental Entrepreneurship*, 11(2): 157-167. DOI: https://doi.org/10.1142/S1084946706000349.

Vera, K., Urribarri, Á., Velita, J., Illa, G. and Chirinos, A. (2024). Influence of the development of entrepreneurial skills on the confidence to undertake in university

students. *Journal of Infrastructure, Policy and Development*, 8(9): 128. DOI: https://doi.org/10.24294/jipd.v8i9.6463.

Wells, T. (2014). Skill Development and Retention through Multiple Laboratory Environments. *The Agricultural education magazine*, 87: 11.

Zickafoose, A. and Wingenbach, G. (2023). Incorporating Field Experience into International Agricultural Development Programs. *Education Sciences*, 13(5): 456. DOI: https://doi.org/10.3390/educsci13050456.

.

.

Authors' Declarations and Essential Ethical Compliances

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*
Conceived and designed the research or analysis	Yes	Yes
Collected the data	Yes	No
Contributed to data analysis & interpretation	Yes	Yes
Wrote the article/paper	Yes	Yes
Critical revision of the article/paper	Yes	Yes
Editing of the article/paper	Yes	No
Supervision	No	Yes
Project Administration	Yes	No
Funding Acquisition	No	No
Overall Contribution Proportion (%)	60	40

Funding
No financial support was received for the research and writing of this article.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

Research involving animals (ARRIVE Checklist)
The author(s) solemnly declare(s) that this research has not involved any animal subject (body or organs) for experimentation. The research was not based on laboratory experiment involving any kind animal. The contexts of animals were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of ARRIVE does not apply in cases of this study or written work.

Research on Indigenous Peoples and/or Traditional Knowledge
The author(s) solemnly declare(s) that this research has not involved Indigenous Peoples as participants or respondents. The contexts of Indigenous Peoples or Indigenous Knowledge were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or prior informed consent (PIC) of the respondents or Self-Declaration in this regard does not apply in cases of this study or written work.

Research involving Plants
The author(s) solemnly declare(s) that this research has involved the plants for experiment and field studies. Some contexts of plants are also indirectly covered through literature review. Thus, during this research the author(s) obeyed the principles of the Convention on Biological Diversity and the Convention on the Trade in Endangered Species of Wild Fauna and Flora.

Research Involving Local Community Participants (Non-Indigenous) or Children
The author(s) solemnly declare(s) that this research has not directly involved any local community participants or respondents belonging to non-Indigenous peoples. Neither this study involved any child in any form directly. The contexts of different humans, people, populations, men/women/children and ethnic people were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or prior informed consent (PIC) of the respondents or Self-Declaration in this regard does not apply in cases of this study or written work.

(Optional) PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)
The author(s) has/have NOT complied with PRISMA standards. It is not relevant in case of this study or written work.

Competing Interests/Conflict of Interest
Author(s) has/have no competing financial, professional, or personal interests from other parties or in publishing this manuscript. There is no conflict of interest with the publisher or the editorial team or the reviewers.

Attribution and Representation
All opinions and mistakes are the author(s)' own and cannot be attributed to the institutions they represent. The publisher is also not responsible either for such opinions and mistakes in the text or graphs or images.

Rights and Permissions

Open Access. This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit http://creativecommons.org/licenses/by/4.0/.

***

To see original copy of these declarations signed by Corresponding/First Author (on behalf of other co-authors too), please download associated zip folder [Declarations] from the published Abstract page accessible through and linked with the DOI: https://doi.org/10.33002/nr2581.6853.070311.